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Forest Insect and Disease Management

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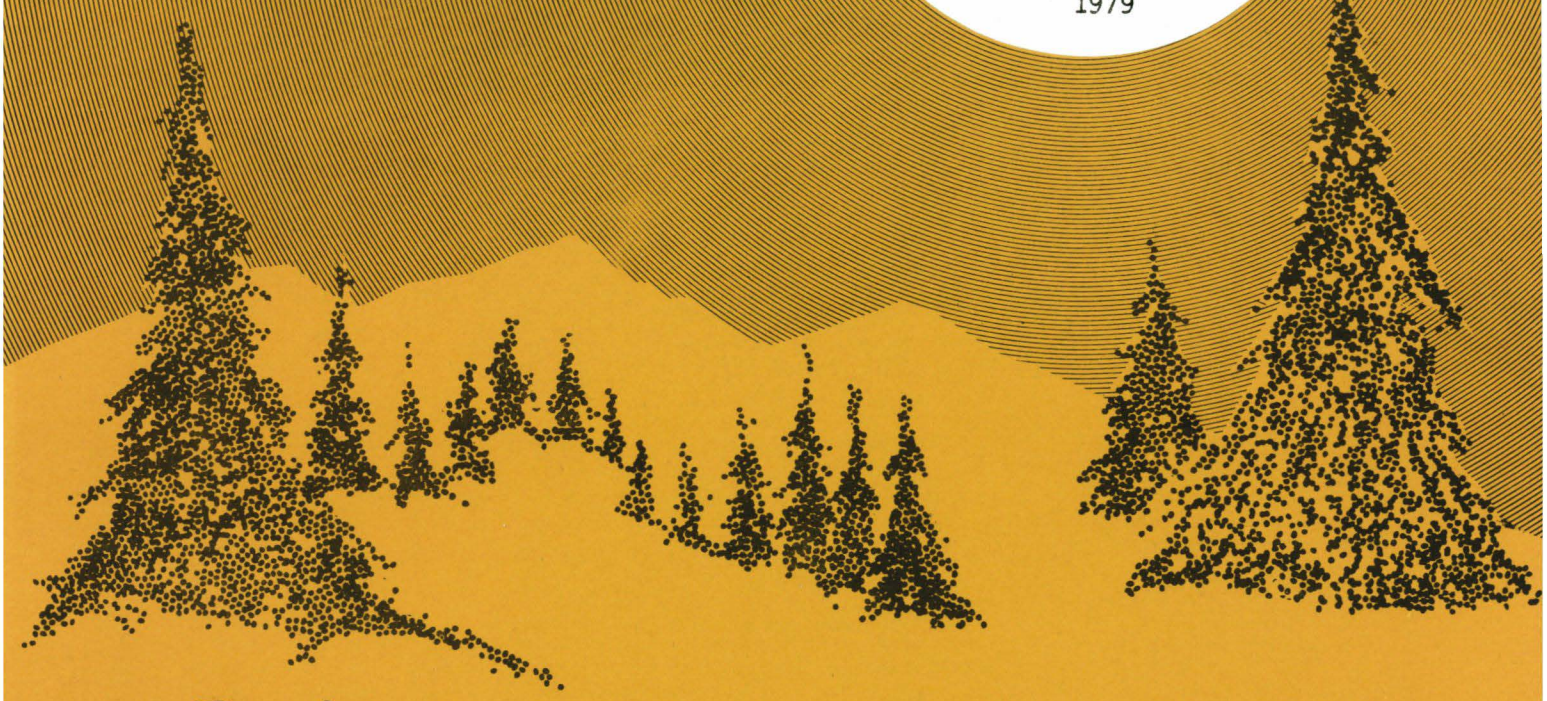
BIOLOGICAL
EVALUATION R2-79-12

MOUNTAIN PINE BEETLE

Bear Lodge Mountains
Black Hills National Forest

1979



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INTRODUCTION

During aerial reconnaissance surveys in September 1979, a large scale outbreak of the mountain pine beetle in ponderosa pine was detected around Warren Peak, Bear Lodge Mountains. The infestation was extensive and estimated to contain 40,000 1978-infested trees. Ground surveys were conducted in the area the week of October 22, 1979 to determine:

1. infestation attack ratio
2. number of infested trees per acre
3. and residual stand basal area.

METHODS

Both strip and variable plot cruises were conducted in 8 sections in the infestation area. The locations of cruise lines are shown in Figure 1. Cruise lines were 1 mile long, one-half chain wide and 10 chains apart. All mountain pine beetle attacked trees were recorded by diameter (d.b.h. to the nearest 0.1 inch) and attack class:

1. New -- 1979-infested
2. Old -- 1978-infested
3. PO -- 1979-pitchout

Variable plots (10 BAF) were located at the beginning and end of each cruise line and at 10-chain intervals along cruise lines. All green ponderosa pine, birch, aspen and spruce trees greater than 5 inches d.b.h. were counted and diameters (d.b.h. to the nearest 0.1 inch) measured.

RESULTS

A summary of the strip cruise data is given in Table 1. The attack ratio indicates that the mountain pine beetle infestation increased from 1978 to 1979. Lines 3-4 and 11-12 show a decreasing infestation and lines 5-6, 7-8, 9-10, 13-14 and 15-16 show an increasing infestation.

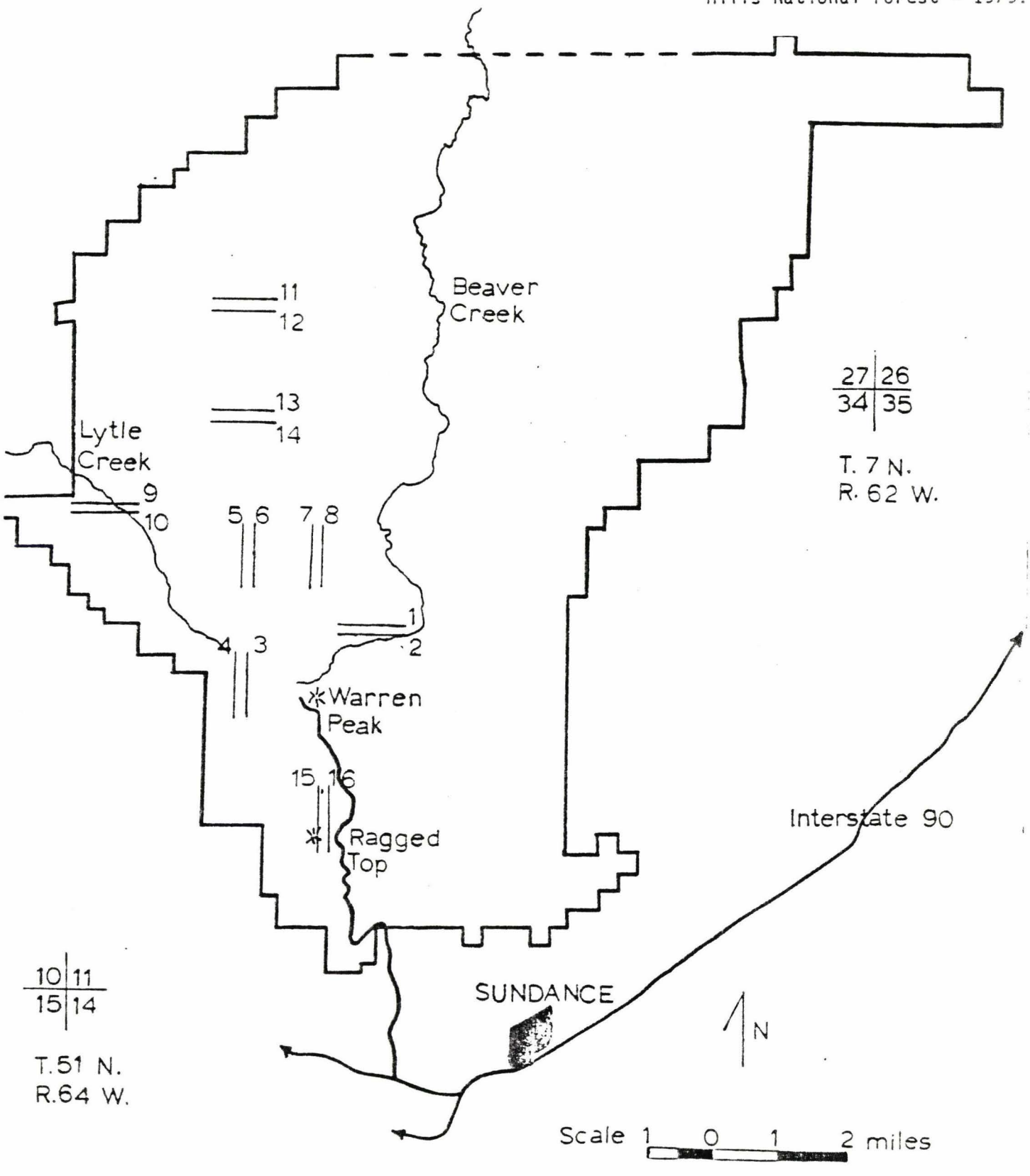

Fig. 1. Location of MPB cruise lines Bear Lodge Mountains, Black Hills National Forest - 1979.

TABLE 1. Summary of strip cruise data, Bear Lodge Mountains, 1979

Survey lines	Diameter (in.) by attack Class			No. of attack trees			New infested trees/ac	Build-up ratio New/Old	Trend
	New	Old	PO	New	Old	PO			
1 - 2	-	-	11.5	-	-	4	-	-	
3 - 4	11.2	11.4	9.6	98	159	26	12.3	0.6	Decreasing
5 - 6	11.9	11.3	7.9	82	54	7	10.3	1.5	Increasing
7 - 8	9.5	9.9	10.1	11	7	17	1.4	1.6	Increasing
9 - 10	10.9	17.3	11.4	35	2	1	4.4	17.5	Increasing
11 - 12	-	8.0	9.3	-	1	2	-	-	Decreasing
13 - 14	11.0	11.2	9.8	24	14	6	3.0	1.7	Increasing
15 - 16	12.6	10.7	9.5	28	23	11	3.5	1.2	Increasing
Total				278	260	74			
Ave. ± SE	11.2 ± 0.4	11.4 ± 1.2	9.9 ± 0.4				5.8 [1/] ± 4.4	1.1 [1/]	Increasing

[1/] Based only on areas where new infested trees were counted

The greatest number of newly infested trees were found in the Lytle Creek and Winchester Creek drainages and around Ragged Top Mountain.

A summary of the variable plot data is given in Table 2.

Average basal area of residual stands ranged from 35.6 ± 6.4 sq ft/ac in the Upper Winchester Creek drainage to 83.3 ± 13.6 sq ft/ac in the Lytle Creek drainage. The average basal area of the residual stand over the survey area is estimated to be 56.3 ± 5.8 sq ft/ac. Basal area information given here does not take into consideration trees less than 5 inches d.b.h. Only trees normally considered to be susceptible to mountain pine beetle attack were recorded. Therefore, actual basal areas will run somewhat higher than indicated. In most cases, where plots contained tree species other than ponderosa pine, these species occurred in pure stands or were dominant over ponderosa pine.

Basal areas within each survey area were highly variable. The factors contributing to this variability were:

1. Eight (8) percent of the plots contained no ponderosa pine due to beetle infestation.

2. Eighteen (18) percent of the plots were in excess of 100 sq ft/ac basal area in all species.

3. Fifty (50) percent of the plots contained 60 sq ft/ac basal area or less in all species.

The average residual ponderosa pine basal area is estimated to be 51.3 ± 5.6 sq ft/ac with a residual stem diameter of 12.6 ± 0.4 inches (d.b.h.).

DISCUSSION

The mountain pine beetle is seriously impacting the ponderosa pine resource in the Warren Peak area. Nearly 58% of all sample plots had residual stand basal areas ranging from 0-60 sq ft/ac. The mountain pine beetle accounted for an average loss of 4 trees per acre in 1978 and 5.8 trees per acre in 1979 over 25,000 acres. This accounts for a loss of 245,000 trees over the two year period. Because of the relatively large number of currently infested ponderosa pines in stands susceptible to mountain pine beetle attack, the infestation is expected to increase in 1980.

TABLE 2. Summary of variable plot data, Bear Lodge Mountains, 1979

Survey lines	Diameter (in) by tree species			Basal area (sq ft/ac) by tree species			
	PP	BIR	ASP	PP ± SE	BIR	ASP	Total ± SE
1 - 2	11.4	-	8.0	62.8 ± 7.3	-	4.4	67.2 ± 6.6
3 - 4	13.0	8.2	6.5	33.9 ± 9.0	0.5	2.8	37.2 ± 9.1
5 - 6	14.6	-	7.9	25.0 ± 5.2	-	10.6	35.6 ± 6.4
7 - 8	12.0	-	6.2	50.6 ± 9.8	-	1.1	51.7 ± 12.2
9 - 10	12.6	7.5	7.7	71.7 ± 14.9	0.5	11.1	83.3 ± 13.6
11 - 12	12.0	-	6.5	60.0 ± 10.0	-	3.3	63.3 ± 9.6
13 - 14	12.0	6.3	6.3	60.6 ± 12.5	0.5	3.3	64.4 ± 11.9
15 - 16	13.0	7.6	5.6	45.6 ± 9.5	0.5	1.7	47.8 ± 9.1
Ave. ± SE	12.6 ± 0.4	7.4 ± 0.4	6.8 ± 0.3	51.3 ± 5.6	0.5 ± 0.0	4.8 ± 1.4	56.3 ± 5.8

Active timber sales aimed at removing beetle infested trees in Lytle Creek and Beaver Creek are salvaging a portion of the ponderosa pine resource. These efforts will provide some localized control of the mountain pine beetle but, will have little impact on the total infestation in the area. Because of the extent and intensity of the infestation in this area both preventative and/or control measures are not practical at this time.

ALTERNATIVES

1. Continue current program. This involves continuing the sales in Lytle and Beaver Creeks but to do nothing in the remainder of the infested area. Additional resource losses would be expected in the majority of the Warren Peak area. The residual ponderosa pine stands are and will continue to be susceptible to mountain pine beetle infestation.

2. Increase Sale activities. This involves increasing removal of beetle infested trees throughout the Warren Peak area particularly around Ragged Top Mountain and in the Winchester and Lytle Creek drainages. This alternative should help reduce ponderosa pine resource loss to the mountain pine beetle.

3. Reduce stand susceptibility north and east of Warren Peak. In areas boardering on the infestation to the north and east of Warren Peak, reduce the residual stand susceptibility to mountain pine beetle. This action will provide for green tree utilization while reducing the future impact of the mountain pine beetle in these stands.

Evaluations to determine the variable(s) involved in tree and stand susceptibility are being conducted throughout the northern Black Hills by FIDM. Variables being evaluated are:

1. The effects of diameter, tree height and crown ratio on tree susceptibility.

2. The effects of basal area, growing stock level, site quality, tree species composition and weather on stand susceptibility.

All current information indicates that stands which appear to be most susceptible to mountain pine beetle have the following characteristics:

a. Stands with highly variable residual stand basal areas. These are not necessarily high average basal area stands but stands with large areas of high basal area. Good examples of this are seen from data on lines 3-4 and 5-6 where the average basal area is 33.9 ± 9.0 sq ft/ac and 25.0 ± 5.2 sq ft/ac, respectively. These two areas have the highest overall new infested trees per acre and the highest variability in residual stand basal area.

b. Ponderosa pine trees with less than one-third functional crown. Small crown trees are normally found in high density stands. Reducing basal area in high density stands will leave residual trees with small crowns which may be susceptible to mountain pine beetle attack for at least 3-5 years until tree crowns are of sufficient size to adequately increase tree vigor.

A re-evaluation of the Warren Peak area will be conducted by FIDM in the Fall of 1980. Up-dated information on tree and stand susceptibility will be used to provide recommendations on a stand basis.